

H. PFANNENSTIEHL.
 SIGNALING SYSTEM.
 APPLICATION FILED JUNE 18, 1917.

1,366,416.

Patented Jan. 25, 1921.
 2 SHEETS—SHEET 1.

Fig. 1.

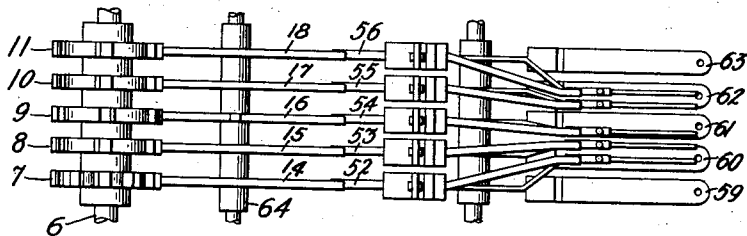
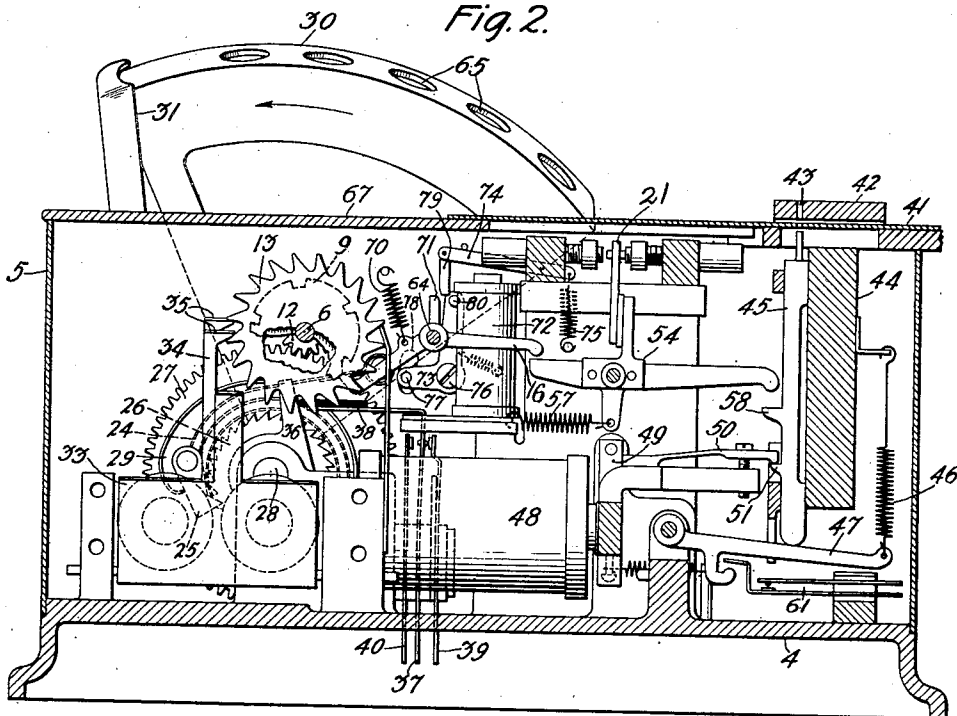


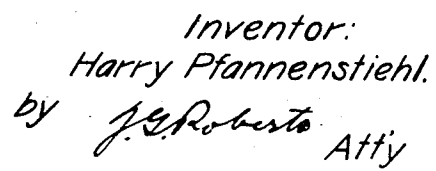
Fig. 2.



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1,366,416.

Fig. 3.



UNITED STATES PATENT OFFICE.

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SIGNALING SYSTEM.

1,366,416.

Specification of Letters Patent.

Patented Jan. 25, 1921.

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To all whom it may concern:

Be it known that I, HARRY PFANNENSTIEHL, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Signaling Systems, of which the following is a full, clear, concise, and exact description.

This invention relates to signaling systems and apparatus, and is particularly adapted to be used in connection with printing telegraph systems.

In printing telegraph systems where an automatic transmitting mechanism is used, it often becomes desirable to interrupt the sending of the message temporarily in order to transmit characteristic operating or bell signals over the line, and for this purpose it is customary to provide a separate automatic control mechanism working in conjunction with the transmitter. The printing mechanisms are as a rule arranged for printing characters in an upper and a lower case in a manner very similar to that employed in connection with the ordinary typewriter, letters being printed in the lower case, and numerals and other characters in the upper case. When it is desired to change from printing in one case to the other, it is first necessary to send a shift or unshift signal which operates the carriage or type wheel at the distant station. In the present type of automatic control mechanism, it is the practice to send the bell signals in the upper case or shifted position. This procedure, however, is objectionable since no provision is made for continuing the sending of shifted characters in case such characters are being sent at the time the automatic control mechanism is operated, and it is therefore necessary to translate the characters back into the desired code.

It is the principal object of the present invention to provide an automatic control mechanism so arranged as to eliminate the objectionable feature of mutilating these signals in case the controller is operated during the printing of shifted characters. A further object is to combine the transmitter and the control mechanism into one piece of apparatus, thereby providing a simpler and cheaper mechanism.

To attain these objects the invention con-

templates a combined transmitter and automatic control mechanism provided with means whereby the mechanism, after being operated to send bell signals, resumes the sending of signals of the same type as were being transmitted before the control mechanism was operated.

The various features of this invention may be more clearly understood by reference to the accompanying drawings, in which Figure 1 is a plan view showing the arrangement of the various cams and levers working in conjunction with the contact members; Fig. 2 is a view, partially in section, showing the arrangement of the apparatus within the casing; and Fig. 3 shows the system of connections diagrammatically.

The transmitting and controlling mechanisms are mounted upon a suitable base and are protected by the inclosing housing. Mounted in suitable bearings within this housing is the shaft 6 carrying the cams 7, 8, 9, 10 and 11, a pinion 12 and an escapement wheel 13. The cam wheels 7 to 11 inclusive are adapted to cooperate with the levers 14 to 18 inclusive and are equipped with various numbers of teeth, as shown, in order to provide for the sending of a predetermined series of impulse groups, as will be explained later. The cam shaft 6 is rotated by a spring motor of the ordinary type, comprising a spiral spring 24, a pawl 25, a ratchet wheel 26, a gear wheel 27, and a shaft 28 supported in suitable bearings. One end of the spring 24 is secured to shaft 28, the other end being secured to the housing. Ratchet wheel 26 is fastened rigidly on shaft 28 and its teeth are engaged by the pawl 25, which is under the tension of the spring 29. Both spring 29 and pawl 25 are carried by gear wheel 27. Located outside of the housing and secured to the shaft 28 is a manually operable control member or setting device 30. This device is preferably in the form of a sector provided with perforations or finger openings whereby a ready means is provided for rotating the shaft 28 in opposition to the spring 24. Insertion of the finger in one of the perforations and the movement of sector 30 in the direction of the arrow until the finger engages a suitable stop 31, results in the winding of the spring 24 an amount depending upon the angle

through which the sector is moved. The various perforations permit moving the sector 30 through corresponding angles and thereby provide means for the sending of 5 signals of different types.

In order to regulate the speed of rotation of the circuit controlling cams, an electromagnetically actuated escapement is provided. This mechanism comprises an electromagnet 32 mounted on base 4 and provided with a pivoted spring tensioned armature 33. This armature has a projecting arm 34 equipped with suitable pallets 35 which are adapted to alternately engage and 15 disengage the teeth of the escapement wheel 13 as electromagnet 32 is energized and de-energized.

Securely located upon the shaft 28 is an arm 36, which is adapted to control the 20 operation of a switch comprising a movable contact spring 37 provided at its outer end with an insulating member 38 and a pair of fixed contact springs 39 and 40. Under normal conditions spring 37 is in contact with 25 spring 39, but when the sector 30 is moved and shaft 28 caused to rotate, the resiliency of spring 37 causes it to move away from spring 39 and make contact with spring 40.

The transmitting portion of this mechanism is of the same general type as described in the French Patent 361,261 of 1906, and is designed for operation in connection with a tape, the perforations of which are preferably arranged for signaling in accordance 35 with the well-known Baudot system of five positive and negative impulses. In transmitting impulses, this tape is passed between the cover 41 and the block 42, perforations 43 in the latter being arranged in 40 alinement with the perforations in the tape. Sliding in the ways 44 are five selecting pins 45 only one of which is shown in Fig. 2. The upper ends of these pins are so formed as to pass through the perforations in the 45 tape when these perforations come in line with the opening in the cover 41 and the block 42. The pins 45 are normally pressed against the tape by means of helical springs 46 which cause the pivoted spring levers 47 50 to bear against the lower portion of the pins. After the sending of each character or group of impulses, the pins 45 are drawn out of engagement with the tape through the operation of the transmitting magnet 48, 55 upon the armature 49 of which is an adjustable arm 50 adapted to bear against projections 51 on the pins 45. The pivoted selecting arms 52 to 56 inclusive, which carry the movable contact springs of pole 60 changers 19 to 23 respectively, are normally held in position by the springs 57, thereby causing the movable contact springs to engage the fixed contacts at the right. However, upon operation of the selecting pins 45 65 the projections 58 engage the pivoted se-

lecting arms, causing the movable contact springs to engage the fixed contacts at the left. Operated by extensions on the levers 47 are the switches 59 to 63 inclusive.

Mounted on a suitable shaft 64 are the 70 cam levers 14, 15, 16, 17 and 18 which are held against the cams 7, 8, 9, 10 and 11 respectively, by the tension of the helical springs 70. These levers are provided with extending arms which are adapted to bear 75 against the selecting arms 52, 53, 54, 55 and 56 and operate the pole changers 19 to 23 in accordance with a predetermined code. The cam lever 16 is also provided with a third arm 71. Associated with this arm 80 and operated in a manner to be hereinafter described, are the electromagnet 72 and the bell crank lever 73. Electromagnet 72 is equipped with an armature 74 normally held 85 away from the core by the tension of the helical spring 75. The bell crank lever 73 rotates on the pivot screw 76, the pin 77 in one arm passing through the slot 78 and bearing against the edge of sector 30 when the latter is unoperated. When electromag- 90 net 72 is operated a finger member 79 pivoted to armature 74 is positioned between the arm 71 and a second pin 80 in bell crank lever 73.

Referring now more particularly to Fig. 95 3, the arrangement of circuit connections and the method of operation will be described. The fixed contacts at the right of pole changers 19 to 23 inclusive are connected to the negative terminals of a 100 grounded source of energy 81, while the fixed contacts at the left of these pole changers are connected to the positive terminal of a grounded source of energy 82. The movable contacts carried on the select- 105 ing arms 52, 53, 54, 55 and 56 are connected to transmitting segments 83, 84, 85, 86 and 87 respectively of an ordinary multiplex distributor. This distributor is also provided with an additional pair of local seg- 110 ments 88 and 89 and a rotatable arm 90 carrying suitable brushes to interconnect segments 83 to 87 inclusive with a common segment 91 and segment 88 with segment 89. Segment 91 is connected to the trans- 115 mission line leading to the distant station either directly, as shown, or if the system is being worked duplex, indirectly in the usual manner. Segment 88 is connected to a grounded source of energy 92, while seg- 120 ment 89 is connected to the movable spring 37 of the controller switch and to a fixed contact 93 of a relay 94. This relay is provided with two windings 95 and 96 differentially wound, so that when the same cur- 125 rent is flowing through both, armature 97 is not attracted. One terminal of each of the windings 95 and 96 is connected to one terminal of the transmitter actuating magnet 48, the other terminal of which is grounded. 130

The other terminal of winding 95 is connected to a movable contact 98 of relay 94, and the other terminal of winding 96 is connected to fixed contact spring 39 of the controller switch. Armature 97 of relay 94 is connected to a grounded source of energy 99.

The electromagnet 72 is provided with windings 100, 101, 102, having a common terminal connected to ground. The other terminal of winding 100 is connected to one of the springs of switch 63, the circuit being so arranged that with switches 59, 60, 62 and 63 operated, a path for current flow is provided from the grounded source of energy 103, through the switches in series, and winding 100 to ground, causing the attraction of armature 74. The other terminal of winding 101 is connected to a grounded source of energy 104, causing a flow of current which is not of sufficient strength to bring about the attraction of armature 74, but is of sufficient strength to hold the armature in position after once being operated by current through the winding 100. Winding 102, the other terminal of which is connected to one of the springs of switch 61, is so wound that when switches 59 to 63 are operated, current flowing from the grounded source of energy 103, through switches 59, 60, 62, 63 and 61, winding 102, to ground, is in such a direction and of sufficient strength to neutralize the magnetizing effect of the combined current flow through windings 100 and 101, thereby allowing armature 74 to be drawn back by the action of spring 75.

The groups of transmitting and local segments which are shown unconnected in Fig. 3 may be associated, as hereinbefore described, with similar transmitters and signaling mechanisms. There will also be provided groups of receiving segments corresponding to the groups of transmitting segments, to which printing apparatus, such, for example, as is disclosed in Patent 1,103,133, of July 14, 1914 is connected. The arrangement of the receiving distributing segments and the manner in which they are associated with the transmission line and printers, and also the rotating of arm 90 in synchronism with a similar arm at the distant station are well-known in the art, and since they form no part of the present invention are neither shown nor described.

The transmitting portion of this mechanism operates in the well-known manner as described in the French patent hereinbefore mentioned. The positions of the selecting pins 45 are determined by the perforations in the tape and they in turn determine the positions of the selecting arms 52 to 56 inclusive, and therefore, the polarity of the current impressed upon the segments 83 to 87. As the brush arm 90 rotates in a clockwise direction, segments 83 to 87 are con-

nected consecutively to segment 91, which in turn is connected to the outgoing line. Therefore, current impulses conforming to the position of the selecting arms 52 to 56 are transmitted over the line. As the rotating arm 90 connects segments 88 and 89 together, a path for current flow is provided from the grounded source of energy 92 to segment 88, brush arm 90, segment 89, thence in parallel through contact 93, movable contact 98, winding 95, and spring 37, spring 39, winding 96, and to ground through the winding of electromagnet 48. Since current flows through both windings 95 and 96 relay 94 is unoperated. The operation of magnet 48 retracts the selecting pins 45 and steps ahead the perforated tape. As the rotating arm 90 leaves segments 88 and 89, magnet 48 is deenergized, allowing the pins 45 to take their positions for the next group of impulses, as determined by the perforations in the tape. As rotating arm 90 again wipes over the segments 83 to 87, the second series of impulses is sent over the line, and as this arm wipes over segments 88 and 89 the tape is again stepped ahead. This operation continues during the automatic transmission of selective impulses. The armature of electromagnet 72 is attracted only when switches 59, 60, 62 and 63 are closed, this being the arrangement of impulses used for shifting the type wheel at the distant station in order to print in the upper case. The operation of this electromagnet, however, does not affect the sending in any way, so long as the sector 30 remains unoperated, and armature 74 is again restored to normal position upon the sending of the un-shift set of impulses which close switches 59 to 63 inclusive.

If it now becomes desirable for some reason to signal the operator at the distant station, where a receiving equipment may be responding to impulses coming from the transmitter described, a finger is inserted in one of the perforations of the sector 30 and the sector is moved in the direction of the arrow until the finger comes in contact with stop 31, whereupon the sector is released. The rotation of sector 30 has turned shaft 28, and has consequently wound spring 24 the required amount, in which condition it is held by the engagement of one of the pallets 35 and a tooth of escapement wheel 13. The rotation of shaft 28 also allows movable contact spring 37 to move away from contact spring 39, and engage contact spring 40. When the rotating arm 90 again interconnects segments 88 and 89 current flows from the grounded source of energy 92, through segment 88, arm 90, segment 89, movable spring 37, fixed spring 40, and magnet 32 to ground. An additional circuit is also provided from segment 89, through fixed contact 93, movable contact 98, winding 95 of relay 94, and electro-

magnet 48 to ground. Since current does not flow through winding 96 of relay 94, armature 97 is attracted, breaking the engagement between contacts 93 and 98 and completing a holding circuit for relay 94 and electromagnet 48 from the grounded source of energy 99, armature 97, movable contact 98, winding 95 of relay 94 and winding of electromagnet 48 to ground. The operation of automatic control magnet 32 allows the escapement wheel 13 to step forward one step, rotating cams 7, 8, 9, 10 and 11. As these cams are stepped forward one step, levers 14, 15, 17 and 18 are operated to cause selecting arms 52, 53, 55 and 56, respectively, to engage the fixed contacts at the left of pole changers 19, 20, 22 and 23. As the rotating arm 90 again wipes over segments 83, 84, 85, 86 and 87, a set of impulses is transmitted to the line in the following order: positive, positive, negative, positive, positive. This arrangement of impulses is the one used to shift the type wheel at the distant office. As the rotating arm 90 again passes over segments 88 and 89, the automatic control relay 32 is operated, causing shaft 28 to rotate a certain amount, and cam 11 withdraws the lever 18 from the selecting arm 56. As the rotating arm 90 now wipes over segments 83 to 87, the impulses transmitted over the line are in the following order: positive, positive, negative, positive, negative. This combination of impulses operates the apparatus at the distant end of the line to give a characteristic signal such as the tapping of a bell. As the brush arm 90 again passes over segments 88 and 89, relay 32 is energized, causing the cams to advance another step. The levers 16 and 18 are operated by cams 9 and 11 respectively, causing the selecting arms 54 and 56 to engage the contacts at the left. Accordingly a set of five positive impulses is sent over the line when arm 90 once more wipes over the contacts 83 to 87. The apparatus at the distant end of the line is adapted, upon receiving five positive impulses, to resume printing in the lower case. After completing this last set of impulses arm 36 contacts with insulating member 38, and movable spring 37 is disengaged from spring 40 and again makes contact with spring 39. Now, as segments 88 and 89 are again interconnected by rotatable arm 90, another path is provided for current flow from the source of energy 92 through winding 96 of relay 94, which being equal to the current flowing from the source of energy 99 in the holding circuit of winding 95, causes armature 97 to be released.

A characteristic combination of impulses has now been transmitted over the line and the apparatus is again in a normal condition. This combination of impulses is adapted to produce, at the distant station,

a distinctive signal such as the tapping of a bell or the lighting of a lamp, and the combination may be produced one or more times, depending upon the amount of movement given the sector 30.

In case a shift signal was sent just previous to the operation of the automatic control sector, the switches 59, 60, 62 and 63 would be operated and the armature 74 of electromagnet 72 attracted. This would move the finger member 79 between the pin 80 of the bell crank lever 73, and the arm 71 of lever 16. The operation of the mechanism would be the same as just described up to the time of sending the last set of impulses. The lever 16 would then be held in place by the finger member 79 interposed between pin 80 and arm 71, and therefore, instead of operating the selecting arm 54, would leave it in position against the fixed contact at the right. The last set of impulses, therefore, instead of being positive, positive, positive, positive, positive, would be positive, positive, negative, positive, positive, and the apparatus at the distant station would remain in the shifted position so as to resume printing in the upper case, as was being done at the time the sector 30 was operated.

What is claimed is:

1. In a signaling system, a plurality of circuit controlling members, means to operate said members selectively, a mechanism comprising cam members associated with said circuit controlling members, and a device for storing energy for the actuation of said cam members whereby said circuit controlling members may be operated independently of said means.

2. In a signaling system, a group of circuit controlling members, means to operate said members selectively, a mechanism comprising cam members associated with said circuit controlling members, a device for storing energy for the actuation of said cam members, and means for releasing said stored energy to actuate said circuit controlling members through the instrumentality of said cam members.

3. In a telegraph transmitter, a line circuit, a first plurality of contacts, means for selectively controlling said contacts in establishing signaling impulses with said line, a second plurality of contacts controlled by said first contacts, a plurality of cams, and means controlled by said cams for selectively operating said first contacts independently of said second contacts in establishing impulses effective with said line.

4. In a signaling device, means for automatically impressing combinations of selecting impulses upon a line, said means including a plurality of selecting fingers and switches operated from said fingers adapted to be included in said line, additional means

for impressing combinations of signaling impulses on said line, said additional means comprising a cam shaft having a plurality of cams thereon, a spring mechanism operating said shaft, a manually operated member for storing energy in said spring mechanism and a lever engaging each of said cams for operating said switches, additional switches operated from said fingers, a circuit closed by said additional switches when operated in a certain combination, and means included in said circuit for modifying the normal operation of said additional means.

5. In a signaling device, means for automatically impressing combinations of selecting impulses upon a line, said means including a plurality of selecting fingers and switches operated from said fingers adapted to be included in said line, additional means for impressing combinations of signaling impulses upon said line, said additional means including a plurality of cam-operated levers for operating said switches, additional switches operated from said fingers, a circuit closed by said additional switches when operated in a certain combination, and electromagnetic means included in said circuit responsive to a certain combination of selecting impulses for preventing one of said levers from operating the corresponding switch.

6. In a telegraph transmitting system, a line circuit, a first plurality of contacts, means to render said contacts selectable in transmitting telegraphic impulses to said line, a second plurality of contacts controlled by said first contacts, electroresponsive means controlled by said second plurality of contacts, a plurality of cams, means controlled by said cams for operating said first contacts in establishing impulses with said line, and means controlled by said electroresponsive means for modifying the order of impulses transmitted through the operation of said cams.

7. In a telegraph transmitter, a line circuit, a first and a second plurality of contacts, first means for selectively controlling said first plurality of contacts in establishing impulses with said line, means controlled by said first contacts to control the operation of said second contacts, a compound wound electromagnet controlled by said second contacts, a plurality of cams, means operated by said cams to control the operation of said first contacts in substitution of said first contact controlling means, and means controlled by said electromagnet for modifying the control of said first contacts as established by said cams.

8. In a telegraph system, a line circuit, a first plurality of transmitting contacts, a punched tape for selectively controlling the operation of said contacts to include signaling impulses with said line, a second plu-

ality of contacts controlled by said first contacts, a compound wound magnet, current of non-operating strength normally established through one winding of said magnet, means controlled by certain of said second plurality of contacts for establishing current of operating strength through a second winding of said magnet, a second means which may be substituted for said perforated tape in operating said first contacts, means controlled by said magnet for modifying the control of said first contacts as established by said second or substitute means, and means controlled by certain of said second plurality of contacts for establishing current through a third winding of said magnet to differentially balance the effect of current as established through the first and second windings of this magnet.

9. In a telegraph transmitter, a line circuit, means for establishing a first predetermined order of signaling impulses with said line, a second means for establishing a second predetermined order of signaling impulses with said line, a compound wound electromagnet controlled in the operations of sending impulses in said first order, and means controlled by said magnet for modifying the signals which may be sent in said second order.

10. In a telegraph transmitter, a first plurality of selectable contacts, tape controlled means for controlling said contacts, a second plurality of contacts controlled by said tape controlled means, an electromagnet, means rendered effective by said second contacts for operating and retaining said electromagnet operatively energized, a plurality of cams arranged to control said first contacts, means for substituting control by said cams for said tape control in operating said first contacts, means controlled by said electromagnet for modifying the control of said first contacts as applied by said cams, and means controlled by said second contacts to establish differential current action for deenergizing said electromagnet.

11. In a telegraph system, a line circuit, transmitting means including a first plurality of contacts arranged for control by a perforated tape, distributor means for successively connecting said transmitting contacts with said line circuit, a second plurality of contacts controlled in the operation of said first contacts, a compound wound magnet controlled by said second contacts, a plurality of cams, means controlled by said cams for operating said first contacts, means for substituting said cam control for said tape control with respect to said first contacts, step-by-step means for controlling said cams, means controlled by said distributor for operating said step-by-step means, means controlled by said magnet for predeterminedly affecting the control of said cams

with respect to said first contacts, and means controlled by said second contacts when responding to operations initiated by said perforated tape to establish accumulative and differential current relations in the control of said magnet.

12. In a telegraph transmitter, a first plurality of contacts, means for rendering said contacts responsive to a perforated tape, other means for rendering said contacts responsive to cam action, a second plurality of contacts respectively responsive with said first contacts during the time they may be operated by said tape controlled means but non-responsive when operated by said cam controlled means, a line circuit, means for rendering said contacts effective in establishing signaling impulses with said line, and means for substituting said cam operated means for said tape operated means in controlling the operation of said contacts.

13. In a printing telegraph, means for transmitting electric impulses of different character over the line comprising two sets of stationary contacts and a set of contacts movable between said stationary contacts, a perforated tape, means controlled by said tape for actuating said movable contacts, a manually movable member, and cams actu-

ated by said member for actuating said movable contacts.

14. In a printing telegraph, means for transmitting impulses of different character over the line comprising a plurality of movable contacts, a plurality of two-armed operating levers for actuating said contacts, a perforated tape, means controlled by the tape for actuating one end of said levers to actuate the contacts, a manually movable member, and means controlled by said member for actuating the other ends of said levers for actuating the same contacts.

15. In a printing telegraph, a perforated tape, a manually movable member and means for actuating the same, message transmitting mechanism comprising a plurality of movable contacts, means controlled by the tape for actuating said contacts, cams operated by said finger wheel for actuating said contacts, and interlocking means operated in response to the movement of said finger-wheel for interrupting the operation of said tape controlled means while the manually movable member is operating.

In witness whereof, I hereunto subscribe my name this 12th day of June A. D. 1917.

HARRY PFANNENSTIEHL.